We Claim:

1. A mechanical prosthetic heart valve, comprising:

an annular housing having an inner surface, and having a top surface defining at least one concave portion and at least one convex portion, the amount of the top surface defining the at least one concave portion being larger than the amount of the top surface defining the at least one convex portion;

at least one leaflet capture projection extending inwardly from the inner surface of the housing, the projection having a substantially circular form in cross-section; and

at least one leaflet disposed adjacent to the inner surface and capable of rotation between an open position in which blood can flow through the heart valve and a closed position in which blood is prevented from flowing through the heart valve, the leaflet comprising:

a main portion including leading and trailing edge surfaces, and inner and outer surfaces connecting the leading and trailing edge surfaces, wherein the inner surface generally defines a convex curvature from the leading edge surface to the trailing edge surface and the outer surface generally defines a convex curvature proximate the leading edge surface and a concave curvature proximate the trailing edge surface; and

first and second winglet portions situated on opposite ends of the leaflet to facilitate rotation of the leaflet.

2. The mechanical prosthetic heart valve of claim 1, wherein the top surface defines at least three concave portions and at least three convex portions.

3. The mechanical prosthetic heart valve of claim 2, wherein the first and second winglet portions are situated adjacent to the inner surface in the vicinity of respective convex portions.

4. The mechanical prosthetic heart valve of claim 3, wherein the amount of the top surface defined by the at least three concave portions is larger than the amount of the top surface defined by the at least three convex portions, so that the inner surface area is reduced.

5. The mechanical prosthetic heart valve of claim 1, wherein the annular housing comprises a nozzle shape along the inner surface.

6. The mechanical prosthetic heart valve of claim 1, wherein the inner surface includes inflow projections to receive the leaflet.

7. The mechanical prosthetic heart valve of claim 1, wherein the valve housing is formed from one of a metallic material, and an organic material and a polymeric material.

8. The mechanical prosthetic heart valve of claim 1, wherein the top surface of the annular housing is scalloped shaped.

9. The mechanical prosthetic heart valve of claim 1, wherein the inner surface of the housing below the convex portion is substantially solid and without perforation.

10. A mechanical early-closing prosthetic heart valve, comprising:

an annular housing having an inner surface, and having a top surface defining at least one concave portion and at least one convex portion, the amount of the top surface defining the at least one concave portion being larger than the amount of the top surface defining the at least one convex portion;

at least one leaflet capture projection extending inwardly from the inner surface of the housing, the projection having a substantially circular form in cross-section; and

at least one leaflet disposed adjacent to the inner surface and capable of rotation between an open position in which blood can flow through the heart valve and a closed position in which blood is prevented from flowing through the heart valve, the leaflet comprising closure means for causing the leaflet to rotate toward a closed position prior to substantial back flow of blood through the heart valve.

11. The mechanical early-closing prosthetic heart valve of claim 10, wherein the top surface defines at least three concave portions and at least three convex portions.

12. The mechanical early-closing prosthetic heart valve of claim 11, wherein the amount of the top surface defined by the at least three concave portions is larger than the amount of the top surface defined by the at least three convex portions.

13. The mechanical early-closing prosthetic heart valve of claim 12, wherein the at least one leaflet comprises:

a main portion including leading and trailing edge surfaces, and inner and outer surfaces connecting the leading and trailing edge surfaces; and

first and second winglet portions situated on opposite ends of the at least one leaflet to facilitate rotation of the leaflet, the first and second winglet portions further situated adjacent to the inner surface in the vicinity of respective convex portions.

14. The mechanical early-closing prosthetic heart valve of claim 10, wherein the top surface of the annular housing is scalloped shaped.

15. The mechanical prosthetic heart valve of claim 10, wherein the inner surface of the housing below the convex portion is substantially solid and without perforation.

16. A mechanical prosthetic heart valve comprising:

an annular housing having an inner surface, and having a top surface defining at least three concave portions and at least three convex portions, wherein the amount of the top surface

defined by the at least three concave portions is larger than the amount of the top surface defined by the at least three convex portions;

at least one leaflet disposed adjacent to the inner surface and capable of rotation between an open position in which blood can flow through the heart valve and a closed position in which blood is prevented from flowing through the heart valve, the at least one leaflet comprising a main portion including leading and trailing edge surfaces, and inner and outer surfaces connecting the leading and trailing edge surfaces, and first and second winglet portions situated on opposite ends of the at least one leaflet adjacent to the inner surface in the vicinity of the respective convex portions to facilitate rotation of the at least one leaflet; and

first and second leaflet pivot structures extending from the inner surface in the vicinity of the respective convex portions, and adapted to cooperate with the first and second winglets, respectively, to facilitate rotation of the at least one leaflet between the open and closed positions, the first and second leaflet pivot structures each including at least one leaflet capture projection extending inwardly from the inner surface of the housing, the projection having a substantially circular form in cross-section.

17. The mechanical prosthetic heart valve of claim 16, further comprising:

at least three leaflets having respective first and second winglet portions; and

at least three first and second leaflet pivot structures adapted to cooperate with respective first and second winglet portions;

wherein the amount of the top surface defined by the at least three convex portions is a predetermined amount to facilitate rotation of the at least three leaflets, and the amount of the top surface defined by the at least three concave portions is a predetermined amount to reduce the surface inner area of the housing.

18. The mechanical prosthetic heart valve of claim 16, wherein the inner surface of the housing below the convex portions is substantially solid and without perforation.

19. A mechanical early-closing prosthetic heart valve, comprising:

an annular housing having an inner surface, and having a top surface defining at least one concave portion and at least one convex portion, the amount of the top surface defining the at least one concave portion being larger than the amount of the top surface defining the at least one convex portion;

at least one leaflet capture projection extending inwardly from the inner surface of the housing, the projection having a substantially circular form in cross-section; and

at least one leaflet disposed adjacent to the inner surface and capable of rotation between an open position in which blood can flow through the heart valve and a closed position in which blood is prevented from flowing through the heart valve, the at least one leaflet comprising an early-closure means for creating a tendency for the leaflet to rotate toward the closed position such that the leaflet is substantially closed prior to initiation of back flow of blood through the heart valve.

20. The mechanical early-closing prosthetic heart valve of claim 19, wherein the top surface defines at least three concave portions and at least three convex portions.

21. The mechanical early-closing prosthetic heart valve of claim 20, wherein the amount of the top surface defined by the at least three concave portions is larger than the amount of the top surface defined by the at least three convex portions.

22. The mechanical early-closing prosthetic heart valve of claim 19, wherein the top surface of the annular housing is scalloped shaped.

23. The mechanical early-closing prosthetic heart valve of claim 22, wherein the top surface of the annular housing is continuous and solid.

24. The mechanical prosthetic heart valve of claim 19, wherein the inner surface of the housing below the convex portion is substantially solid and without perforation.